

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Akifumi KAMIJIMA; Hisayoshi WATANABE

Application No.: New U.S. Patent Application

Filed: October 1, 2001

Docket No.: 110735

For: A METHOD FOR FABRICATING A RESIST PATTERN, A METHOD FOR
PATTERNING A THIN FILM AND A METHOD FOR MANUFACTURING A
MICRO DEVICE

PRELIMINARY AMENDMENT

Director of the U.S. Patent and Trademark Office
Washington, D. C. 20231

Sir:

Prior to initial examination, please amend the above-identified application as follows:

IN THE CLAIMS:

Please replace claims 3, 6, 10, 13, 16, 19, 20, 23, 26, 29, 30, 33, 36, 39, 40, 43, 44 and
46 as follows:

3. (Amended) A fabricating method as defined in claim 1, wherein the pre-resist pattern
and the resist pattern is composed of a photoresist layer as a top layer and a
polymethylglutarimide layer as a bottom layer.

6. (Amended) A fabricating method as defined in claim 1, wherein the pre-resist pattern
and the resist pattern is made of a picture reversion type photoresist which is made by adding
a negative working agent to a positive type photoresist including a mixture of alkaline soluble
phenol resin and naphthoquinonediazido.

10. (Amended) A fabricating method as defined in claim 1, wherein the pre-resist
pattern and the resist pattern is made of a novolac type positive photoresist containing an
additive phenol dissolution accelerator.

13. (Amended) A method for patterning a thin film using a resist pattern as defined in claim 1.

16. (Amended) A patterning method as defined in claim 14, wherein the pre-resist pattern and the resist pattern have their respective T-shaped or reversed trapezoid longitudinal cross sections.

19. (Amended) A patterning method as defined in claim 17, wherein the ashing treatment is carried out by using a process gas composed of oxygen gas containing at least one of fluorine-based gas and nitrogen/hydrogen gas mixture.

20. (Amended) A patterning method as defined in claim 17, wherein the pre-resist pattern and the resist pattern have their respective T-shaped or reversed trapezoid longitudinal cross sections.

23. (Amended) A patterning method as defined in claim 21, wherein the pre-resist pattern and the resist pattern have their respective T-shaped or reversed trapezoid longitudinal cross sections.

26. (Amended) A patterning method as defined in claim 24, wherein the pre-resist pattern and the resist pattern have their respective T-shaped or reversed trapezoid longitudinal cross sections.

29. (Amended) A patterning method as defined in claim 27, wherein the ashing treatment is carried out by using a process gas composed of oxygen gas containing at least one of fluorine-based gas and nitrogen/hydrogen gas mixture.

30. (Amended) A patterning method as defined in claim 27, wherein the pre-resist pattern and the resist pattern have their respective T-shaped or reversed trapezoid longitudinal cross sections.

33. (Amended) A patterning method as defined in claim 31, wherein the pre-resist pattern and the resist pattern have their respective T-shaped or reversed trapezoid longitudinal cross sections.

36. (Amended) A patterning method as defined in claim 34, wherein the pre-resist pattern and the resist pattern have their respective T-shaped or reversed trapezoid longitudinal cross sections.

39. (Amended) A patterning method as defined in claim 37, wherein the ashing treatment is carried out by using a process gas composed of oxygen gas containing at least one of fluorine-based gas and nitrogen/hydrogen gas mixture.

40. (Amended) A patterning method as defined in claim 37, wherein the pre-resist pattern and the resist pattern have their respective T-shaped or reversed trapezoid longitudinal cross sections.

43. (Amended) A patterning method as defined in claim 41, wherein the pre-resist pattern and the resist pattern have their respective T-shaped or reversed trapezoid longitudinal cross sections.

44. (Amended) A method for manufacturing a micro device, using a patterning method for a thin film as defined in claim 13.


46. (Amended) A manufacturing method as defined in claim 45, wherein the magneto-resistive effective type thin film element of the thin film magnetic head is manufactured by a patterning method comprising the steps: forming a thin film to be milled on a given base material, forming a polymethylglutarimide layer on the thin film to be milled, forming a photoresist layer on the polymethylglutarimide layer, exposing and developing the photoresist layer via a given mask, partially removing the remaining polymethylglutarimide layer with an alkaline water solution to form a pre-resist pattern constructed of the photoresist layer as a top layer and the polymethylglutarimide layer as a bottom layer, ash-treating the pre-resist pattern to a narrowed resist pattern, and milling the thin film to be milled via the resist pattern to obtain a patterned thin film.

REMARKS

Claims 1 - 46 are pending. By this Preliminary Amendment, claims 3, 6, 10, 13, 16, 19, 20, 23, 26, 29, 30, 33, 36, 39, 40, 43, 44 and 46 are amended to remove multiple dependencies. Prompt and favorable examination on the merits is respectfully requested.

The attached Appendix includes marked-up copies of each rewritten claim (37 C.F.R. 1.121(c)(1)(ii)).

Respectfully submitted,


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APPENDIX

Changes to Claims:

The following are marked-up versions of the amended claims:

3. (Amended) A fabricating method as defined in claim 1 ~~or~~ 2, wherein the pre-resist pattern and the resist pattern is composed of a photoresist layer as a top layer and a polymethylglutarimide layer as a bottom layer.

6. (Amended) A fabricating method as defined in claim 1 ~~or~~ 2, wherein the pre-resist pattern and the resist pattern is made of a picture reversion type photoresist which is made by adding a negative working agent to a positive type photoresist including a mixture of alkaline soluble phenol resin and naphtoquinonediazido.

10. (Amended) A fabricating method as defined in claim 1 ~~or~~ 2, wherein the pre-resist pattern and the resist pattern is made of a novolac type positive photoresist containing an additive phenol dissolution accelerator.

13. (Amended) A method for patterning a thin film using a resist pattern as defined in ~~any one of claims 1-12~~ claim 1.

16. (Amended) A patterning method as defined in claim 14 ~~or~~ 15, wherein the pre-resist pattern and the resist pattern have their respective T-shaped or reversed trapezoid longitudinal cross sections.

19. (Amended) A patterning method as defined in claim 17 ~~or~~ 18, wherein the ashing treatment is carried out by using a process gas composed of oxygen gas containing at least one of fluorine-based gas and nitrogen/hydrogen gas mixture.

20. (Amended) A patterning method as defined in claim 17 ~~or 18~~, wherein the pre-resist pattern and the resist pattern have their respective T-shaped or reversed trapezoid longitudinal cross sections.

23. (Amended) A patterning method as defined in claim 21 ~~or 22~~, wherein the pre-resist pattern and the resist pattern have their respective T-shaped or reversed trapezoid longitudinal cross sections.

26. (Amended) A patterning method as defined in claim 24 ~~or 25~~, wherein the pre-resist pattern and the resist pattern have their respective T-shaped or reversed trapezoid longitudinal cross sections.

29. (Amended) A patterning method as defined in claim 27 ~~or 28~~, wherein the ashing treatment is carried out by using a process gas composed of oxygen gas containing at least one of fluorine-based gas and nitrogen/hydrogen gas mixture.

30. (Amended) A patterning method as defined in claim 27 ~~or 28~~, wherein the pre-resist pattern and the resist pattern have their respective T-shaped or reversed trapezoid longitudinal cross sections.

33. (Amended) A patterning method as defined in claim 31 ~~or 32~~, wherein the pre-resist pattern and the resist pattern have their respective T-shaped or reversed trapezoid longitudinal cross sections.

36. (Amended) A patterning method as defined in claim 34 ~~or 35~~, wherein the pre-resist pattern and the resist pattern have their respective T-shaped or reversed trapezoid longitudinal cross sections.

39. (Amended) A patterning method as defined in claim 37 ~~or 38~~, wherein the ashing treatment is carried out by using a process gas composed of oxygen gas containing at least one of fluorine-based gas and nitrogen/hydrogen gas mixture.

40. (Amended) A patterning method as defined in claim 37 ~~or 38~~, wherein the pre-resist pattern and the resist pattern have their respective T-shaped or reversed trapezoid longitudinal cross sections.

43. (Amended) A patterning method as defined in claim 41 ~~or 42~~, wherein the pre-resist pattern and the resist pattern have their respective T-shaped or reversed trapezoid longitudinal cross sections.

44. (Amended) A method for manufacturing a micro device, using a patterning method for a thin film as defined in ~~any one of claims 13-43~~ claim 13.

46. (Amended) A manufacturing method as defined in claim 45, wherein the magneto-resistive effective type thin film element of the thin film magnetic head is manufactured by ~~the a~~ patterning method comprising the steps: forming a thin film to be milled on a given base material, forming a polymethylglutarimide layer on the thin film to be milled, forming a photoresist layer on the polymethylglutarimide layer, exposing and developing the photoresist layer via a given mask, partially removing the remaining polymethylglutarimide layer with an alkaline water solution to form a pre-resist pattern constructed of the photoresist layer as a top layer and the polymethylglutarimide layer as a bottom layer, ash-treating the pre-resist pattern to a narrowed resist pattern, and milling the thin film to be milled via the resist pattern to obtain a patterned thin film as defined in any one of claims 13-43.